Clean Estuary Partnership
CEP

INFORMATION ON THE SAN FRANCISCO BAY

MERCURY TMDL

High levels of mercury in San Francisco Bay fish prompted State health officials to issue a fish consumption advisory warning the public to limit their consumption of Bay fish. In addition, studies indicate that mercury poses a threat to wildlife in the Bay, including rare and endangered species such as the California least tern. Because mercury impairs the Bay's beneficial uses, which include sport fishing, wildlife habitat, and preservation of rare and endangered species, all segments of San Francisco Bay have been listed as "impaired" (See side bar *The Clean Water Act and TMDLs*). To resolve this significant water quality problem, the San Francisco Bay Regional Water Quality Board (Water Board) staff is considering adopting a Total Maximum Daily Load (TMDL) for mercury in the Bay.

The Clean Water Act & TMDLs

The federal Clean Water Act recognizes that every body of water provides benefits that are valuable and worth protecting. The beneficial uses of a particular water body might include, for example, catching and eating fish, swimming, and drinking. Some water bodies lack the water quality necessary to support their beneficial uses and are considered "impaired waters."

The Clean Water Act requires each state to develop a list of impaired waters and the pollutants that impair them. Total Maximum Daily Loads (TMDLs) must then be developed for each impaired water body. TMDLs are actions to restore clean water by examining water quality problems, identifying sources of pollutants, and specifying actions that create solutions. TMDLs define how much of a pollutant a water body can tolerate and still meet water quality standards.

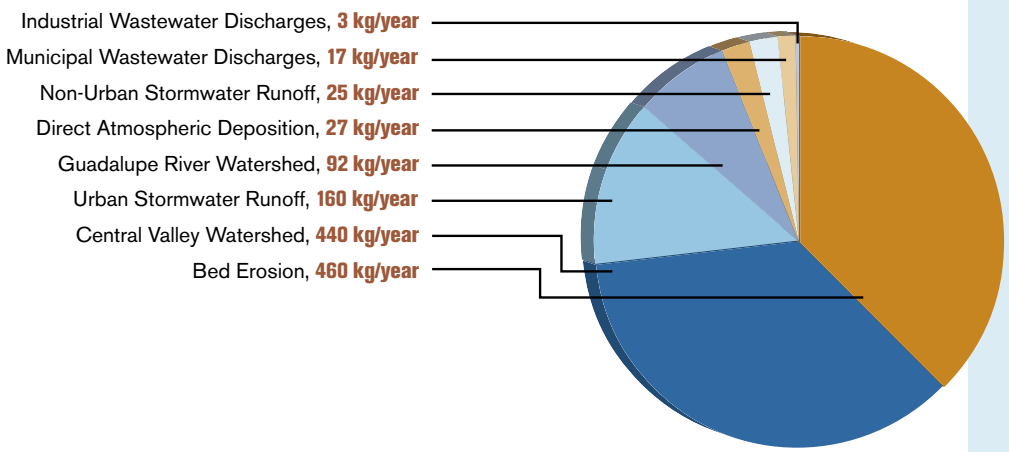
Water quality standards:

- Describe the beneficial uses of a water body to be protected (such as water contact recreation, drinking water, sport and commercial fishing, and aquatic life).
- Set numeric and narrative water quality objectives to protect beneficial uses.
- Establish provisions to prevent degradation of existing water quality.

What Are the Major Sources of Mercury to San Francisco Bay?

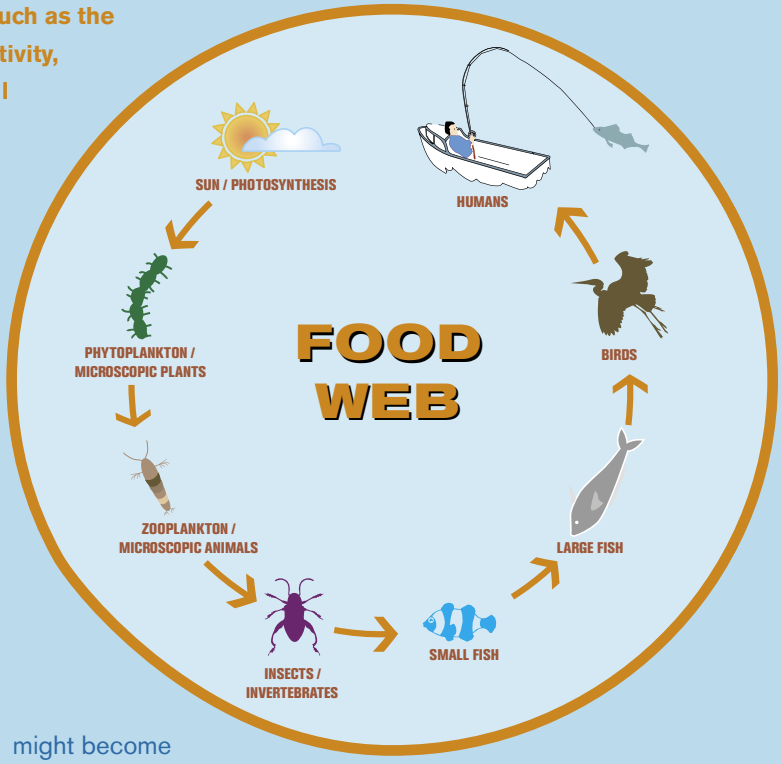
High levels of mercury in San Francisco Bay are primarily the result of mining during California's Gold Rush and a variety of contemporary sources. As part of the gold extraction process, mercury was used to extract gold from gold-bearing rocks, and was released into the air and waterways. Much of this mercury washed downstream to San Francisco Bay. Approximately 26 million pounds of mercury were used in gold mines in the 19th century, and as much as 8 million pounds of mercury accumulated in Bay sediment. A significant amount of this mercury came from mercury mines in the San Francisco Bay Area. In particular, the New Almaden mercury mines in the Guadalupe River watershed were the largest operating mercury mines in North America. These mines left a legacy of mercury pollution in piles of waste rock, surface soils, and stream sediment. Mercury-laden sediment that accumulated on the Bay floor over past decades is now eroding back into the water; this process is referred to as bed erosion and is a significant source of mercury. About 1,220 kilograms (kg) of mercury enters San Francisco Bay each year (yr) from the following sources:

Mercury Sources



Mercury in the Environment

Mercury enters the environment through both natural sources, such as the normal breakdown of minerals in rocks and soils, and human activity, such as the use of mercury-containing products, burning of fossil fuels, and mining. Because of its useful properties, mercury is used in a variety of household and industrial products, including thermometers, thermostats, fluorescent lamps, electrical switches, medical equipment, and dental fillings. Gradually the public is learning how to dispose of these items properly, but further outreach is still needed. For more information on how to dispose of these items, please contact 1-800-CLEANUP or visit www.cleanup.org.



Mercury in the Food Web

Some mercury that reaches Bay Area waters may be converted to methylmercury, the highly toxic organic form of mercury that is readily absorbed by fish and accumulates in the food web. As mercury moves through the food web – from small fish to bigger fish to wildlife to people – the amount of mercury builds up, increasing the risk to consumers at the top of the food web. Mercury concentrations in some bird eggs harvested from the San Francisco Bay shore are high enough to account for abnormally high numbers of eggs failing to hatch.

How Am I Exposed to Mercury?

The greatest risk of exposure to mercury is through consumption of fish. The amount of exposure depends on how often and how much fish you eat as well as what type of fish you eat. Health officials in California have issued fish consumption advisories for San Francisco Bay due to elevated mercury levels. Sport and subsistence fishers who regularly catch and eat Bay fish face increased risk, and the Water Board is working with the Office of Environmental Health Hazard Assessment (OEHHA) to help reduce this risk. Risk management measures will include public education on the risk levels of various species, preparation techniques to reduce exposure, and fish warnings in multiple languages. For more details on the OEHHA fish consumption advisory, visit www.oehha.ca.gov/fish.html

In addition, in March 2004, the U.S. Environmental Protection Agency and the U.S. Food and Drug Administration issued a joint consumer advisory for pregnant women, women who might become pregnant, nursing mothers, and young children who eat commercial fish. The advisory cautions them to avoid certain types of fish (shark, swordfish, king mackerel, and tile fish) and to limit their consumption of other types of commercial fish. For more information on this advisory, visit www.cfsan.fda.gov/~dms/admehg3.html

What Health Effects Are Caused by Mercury Exposure?

In humans, mercury is neurotoxic, affecting the brain and spinal cord, and interfering with nerve function. Pregnant women and nursing mothers can pass mercury to their fetuses and infants through the placenta and breast milk. In children, particularly those under age six, mercury can decrease brain size, delay physical development, impair mental abilities, cause abnormal muscle tone, and result in coordination problems. Substantial mercury exposure is also associated with birth defects and infant mortality. Adults exposed to mercury may experience abnormal sensations in their hands and feet, tiredness, or blurred vision. Higher levels of mercury exposure can impair hearing and speech. Long-term exposure can damage the kidneys.

What Can I Do to Help?

To help protect the Bay, citizens should recycle mercury-containing fluorescent light bulbs, thermostats, thermometers, and other items. For more information, contact **1-800-CLEANUP or visit www.cleanup.org.**

Information on the Mercury TMDL

Measurable Targets to Protect San Francisco Bay

Specific numeric targets are proposed to protect San Francisco Bay and its beneficial uses.

- To protect sport fishing and human health, the average mercury concentration in Bay **fish tissue** should be reduced by about 40% to 0.2 parts per million (ppm).
- To protect wildlife and rare and endangered species, the mercury concentration in wild **bird eggs** should be reduced more than 25% to a concentration below 0.5 ppm.
- To achieve the fish tissue and bird egg targets and to attain water quality standards, the mercury concentration in **suspended sediment** should be reduced by about 50%; the median mercury concentration in sediment should be 0.2 ppm.

Water Board staff estimates that current mercury sources will need to be reduced from 1,220 to 706 kg/yr in order to meet these targets. The TMDL allocates allowable loads to each source.

What Actions Will Help Restore the Bay?

Actions and further studies are proposed to help protect the fish, wildlife, and people of the San Francisco Bay Area. Some actions are already underway to reduce mercury concentrations in the Bay. As the effectiveness of some of these actions is still uncertain, certain actions may need to be reviewed and potentially revised as new information becomes available about their efficacy. Also, TMDLs are now being developed to address the mercury mining legacy in the Guadalupe River Watershed and mercury sources in the Central Valley and these TMDLs must include actions that would help achieve the targets for these sources.

Expanded efforts are needed to implement pollution prevention programs and address mercury-contaminated areas throughout the Bay Area, such as mines and industrial sites. Studies to refine the technical information on which the TMDL is based are also planned, including possible measures to reduce the transformation of less toxic forms of mercury to methylmercury (the highly toxic organic form of mercury that accumulates in the food web). As more information is gained from these planned studies on reducing mercury-related toxicity, additional actions may be necessary, such as elimination or reduction of mercury-containing products.

An Adaptive Approach

The Mercury TMDL would be implemented using an adaptive implementation approach, which means taking immediate actions based on available information and adapting the approach as new information becomes available. Approximately every five years, the Water Board will review the San Francisco Bay Mercury TMDL; evaluate new and relevant information from monitoring, special studies, and scientific literature; and make any necessary changes to the targets, allocations, or implementation plan. For example, as reliable information becomes available regarding how to control the rate at which mercury is converted to methylmercury or whether certain

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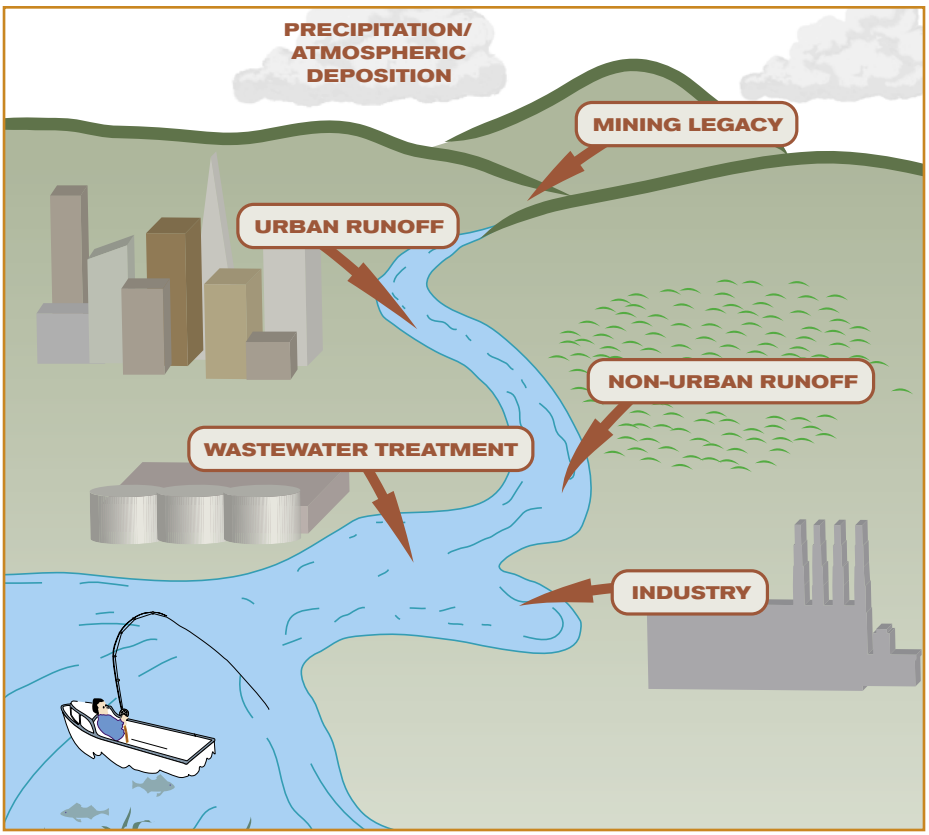
The proposed Mercury TMDL outlines an "implementation plan" with four objectives:

- **Reduce total mercury loads** to the Bay
- **Reduce methylmercury formation** and consequent risk to humans and wildlife exposed to methylmercury
- **Undertake monitoring and focused studies** to track progress and improve technical understanding of the system
- **Identify and encourage actions** which address not only mercury but other contaminants, such as polychlorinated biphenyls (PCBs)

Sources of Mercury to San Francisco Bay



Next Steps

On September 15, 2004, the Water Board will conduct a hearing at which they will consider adopting the San Francisco Bay Mercury TMDL in the form of an amendment to the Water Quality Control Plan for the San Francisco Bay Basin (Basin Plan). If the Water Board approves the Basin Plan Amendment, it will go to the State Water Resources Control Board for review and approval, then to the California Office of Administrative Law, and then to the U.S. Environmental Protection Agency for final review and approval. For more information on this process, see our fact sheet "Adopting TMDLs: the Basin Planning Process" available online at www.swrcb.ca.gov/rwqcb2/tmdlmain.htm.

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sources (such as bed erosion), are more bioavailable (likely to be absorbed by wildlife and humans), the Water Board will consider adjusting allocations to implement the TMDL more effectively. The Water Board will also evaluate whether effective measures are in place to reduce human and wildlife exposure to methylmercury. Monitoring will be conducted to assess the effectiveness of the actions and progress toward meeting the proposed targets. The Water Board will also work with other California agencies like the OEHHA and the Department of Health Services to attempt to manage the human health risk from consumption of mercury-contaminated Bay fish.

How Long Will It Take for the Bay to Recover?

The proposed implementation plan calls for phasing in actions over the next 20 years. Water Board staff projects that these actions, along with natural Bay sediment erosion, will result in recovery in approximately 120 years. While this may sound like a long time, the majority of the mercury in the Bay is the legacy of historic mining dating back 150 years to the Gold Rush era. It took many decades for this amount of mercury to accumulate, and, at the current rate of erosion, will take many more decades to leave the Bay. Water Board staff estimates that the current total mass of mercury in the active sediment layer (sediment on the Bay floor that is regularly resuspended and deposited as a result of tides, waves, and wind) is 63,000 kg. Even if we stopped 100% of the mercury entering the Bay today, it could still take decades for the Bay to recover. It is anticipated that as the amount of mercury in sediment slowly decreases, concentrations in fish will also decline, and there will be reduced risks to humans and wildlife.

How Was the TMDL Developed?

Water Board staff developed this TMDL with significant input from interested parties. The process began prior to 1998 and involved reviewing 10 years of water quality data from the Regional Monitoring Program for Trace Substances (RMP). Water Board staff also reviewed and incorporated information from over 130 relevant books, peer reviewed scientific articles, and government documents. The RMP is a collaborative effort of the Water Board, the regulated entities that fund the RMP (currently 83 wastewater dischargers and dredgers), and the San Francisco Estuary Institute, an independent non-profit scientific research organization.

The Clean Estuary Partnership, a collaborative effort of the Water Board, the Bay Area Clean Water Agencies, and the Bay Area Stormwater Management Agencies Association, provided technical support and data for this TMDL. The Mercury Watershed Council, which consists of a range of interested parties, including industry, environmental groups, and the dredging community, has also provided extensive comment and input over the last 5+ years.

ABOUT THE CEP. The Clean Estuary Partnership (CEP) is an innovative collaboration of the Bay Area Clean Water Agencies (BACWA), the Bay Area Stormwater Management Agencies Association (BASMAA), and the California Regional Water Quality Control Board San Francisco Bay Region (Water Board). Other key participants include the San Francisco Estuary Institute, the Clean Water Fund, San Francisco Baykeeper, the Port of Oakland, and the Western States Petroleum Association. The CEP works with Water Board staff to fund and conduct technical research and analysis to support Total Maximum Daily Load (TMDL) development. The CEP has established a multi-year program for addressing water quality in San Francisco Bay that will address pollutants including PCBs, selenium, cyanide, copper, nickel, and pesticides.

Contact Us

Clean Estuary Partnership
1515 Clay Street, Suite 1400
Oakland, CA 94612
info@cleanestuary.org
(510) 622-4592

Web Sites

Clean Estuary Partnership: www.cleanestuary.org
BACWA: www.bacwa.org
BASMAA: www.basmaa.org
Water Board TMDL web pages: www.swrcb.ca.gov/rwqcb2/tmdlmain.htm
Fish Consumption Advisory Information: www.oehha.ca.gov/fish.html
www.cfsan.fda.gov/~dms/admehg3.html